

would doubtless be above the base of the pectorals, as recorded by Jordan in *Mitsukurina*. Another specimen (Brit. Mus. no. P. 4769) shows that the teeth in *S. Lewisi* are about as numerous as in *Mitsukurina Owstoni*, while, as in the latter species, those at the mandibular symphysis are slightly larger than those at the front of the upper jaw. All the fins are known in the two fossil species from Mount Lebanon except the anterior dorsal; and on comparing the figure of such a specimen as B. M. no. P. 4020* with that of the recent fish given by Jordan, it will be observed that the differences in proportions are not of greater than specific value. The arrangement of the basal cartilages of the fins, so beautifully represented by Jordan, is unfortunately not distinct in any of the Lebanon fossils; nor is there any clear evidence of the claspers. The dense shagreen seems to be similar in the recent and fossil forms.

The type specimen of *Mitsukurina Owstoni* measures slightly more than a metre (42 inches) in length, and is described as apparently young. The known specimens of *Scapanorhynchus Lewisi* cannot have attained a greater length than 0.5 m., while the only complete specimen of *S. elongatus* measures about 0.65 m. in length. Some of the other species, however, represented in Cretaceous formations solely by their teeth, evidently attained considerably larger dimensions, and must have been very much larger even than the Japanese fish now captured. In Cretaceous seas it was evidently a dominant type among the predaceous sharks.

LXVII.—*Note on some Cretaceous Clupeoid Fishes with Pectinated Scales (Utenothrissa and Pseudoberyx)*. By A. SMITH WOODWARD, F.L.S.

A RECENT detailed study of the so-called Berycidae of the Cretaceous period has led to the recognition of several allies of the herrings among them. There is evidence of at least two genera, whose osteological characters necessitate their reference to the family Clupeidae as defined in Dr. Günther's British Museum Catalogue. Both are characterized by large pectinated scales, like those of the existing Clupeoid genus *Brevoortia* †; but neither exhibits any ventral or dorsal ridge-

* A. S. Woodward, 'Catal. Foss. Fishes B.M.' part i. (1889), pl. xvii. fig. 1.

† Gill, Proc. Acad. Nat. Sci. Philad. 1861, p. 37; Jordan and Evermann, "Fishes of North and Middle America," Bull. U.S. National Museum, no. 47 (1896), p. 433.

scales. The first genus has not hitherto been defined, and may receive the new name of *Ctenothrissa*; the second has already been described as *Pseudoberyx*.

CTENOTHRISSA, gen. nov.

Definition. Head large; trunk deeply fusiform and laterally compressed, but ventral border of abdomen flattened. Maxilla robust and arched, with two large supramaxillary bones; mandible deep, a little prominent, and gape of mouth not extending behind the middle of the large orbit; minute teeth on the margin of the jaws. Preoperculum only slightly expanded; operculum and suboperculum deep and narrow. Vertebrae from 30 to 40 in number, half being caudal. Pelvic fins much enlarged and inserted far forwards; dorsal fin much deepened, occupying about half of the back; anal fin small; caudal fin deeply cleft. Scales pectinated, large and regularly arranged, none enlarged or thickened, and no dorsal or ventral ridge-scales; lateral line conspicuous.

Type. So-called *Beryx vexillifer*, Pictet, from Upper Cretaceous, Hakel, Mount Lebanon.

The three best-known species are:—

(1) *Ctenothrissa vexillifer*, Pictet, sp.

Originally referred to *Beryx* by F. J. Pictet (Descript. Poiss. Foss. Mt. Liban (1850), p. 8, pl. i. fig. 1). The fine series of specimens of this species in the British Museum clearly shows the Clupeoid head, which, indeed, is partly represented in the restoration by Pictet and Humbert (Nouv. Rech. Poiss. Foss. Mt. Liban (1866), pl. ii. fig. 3). The premaxilla is very small and the loose arched maxilla relatively large, with two supramaxillaries, as in *Clupea*. It is quite clear that none of the fin-rays are spinous. The largest specimens are about 0.07 m. in length, and the specific characters may be briefly stated as follows:—Length of head with opercular apparatus approximately equal to the maximum depth of the trunk, and contained about one and a half times in the length from the pectoral arch to the base of the caudal fin. 30 vertebrae. Pectoral fins about half as long as the pelvic pair, which are inserted beneath the former and comprise 8 stout rays, the foremost only articulated distally, the others both divided and articulated distally, the longest when adpressed to the trunk reaching the anal fin; dorsal fin with 18 to 20 rays, the sixth longest; anal fin with 13 or 14 rays, opposite the hinder third of the dorsal. Scales very finely pectinated. Known only from the Upper Cretaceous of Hakel, Mount Lebanon.

(2) *Ctenothrissa radians*, Ag., sp.

Originally referred to *Beryx* by Agassiz (Poiss. Foss. vol. iv. pp. 4, 118, pl. xiv. *b.* fig. 7, pl. xiv. *c.* figs. 7-9). Several specimens of this species in the British Museum exhibit the typical Clupeoid head, one (no. P. 5699) being especially well preserved and displaying the minute teeth both on the maxilla and premaxilla. None of the fin-rays are spinous, the appearance of a pelvic spine in the type specimen, as described by Agassiz, being proved by other specimens to be deceptive. The species attains a length of about 0·25 m., and may be briefly defined thus:—Head with opercular apparatus relatively smaller than in *C. vexillifer*, and marked with a fine rugose ornament. About 40 vertebræ. Pelvic fins with 7 or 8 stout rays, which, when adpressed to the trunk, extend to the anal fin; anal fin with at least 12 rays, arising opposite the hinder end of the dorsal fin. Scales very finely pectinated; lateral line extending along the ninth series above that which forms the ventral border of the flank. Common in the Lower Chalk of England.

(3) *Ctenothrissa microcephala*, Ag., sp.

Originally referred to *Beryx* by Agassiz (*tom. cit.* pp. 4, 119, pl. xiv. *b.* figs. 3-6, pl. xiv. *c.* fig. 10). As in the two preceding species, so in this, the British Museum collection demonstrates the presence of a Clupeoid head and the absence of fin-spines. This fish is rather elongated and attains a length of about 0·15 m. The length of the head with opercular apparatus equals the maximum depth of the trunk and is contained about twice in the length from the pectoral arch to the base of the caudal fin. Fins apparently as in *C. radians*, but the pelvic fins less elongated. Scales relatively large and coarsely pectinated; lateral line extending along the fourth series above that which forms the ventral border of the flank. Common in the Lower Chalk of England.

PSEUDOBERYX, Pictet and Humbert.

[Nouv. Rech. Poiss. Foss. Mt. Liban, 1866, p. 32.]

Definition. Head and opercular apparatus as in *Ctenothrissa*. Vertebræ approximately 30 in number, half being caudal. Paired fins small, the pelvic pair inserted opposite the dorsal, which is short-based and nearly median; anal fin smaller than the dorsal; caudal fin deeply cleft. Scales pectinated, large and regularly arranged, none enlarged or thickened, and no dorsal or ventral ridge-scales.

Type. *Pseudoberyx syriacus*, Pict. & Humb. (*op. cit.* p. 33, pl. ii. figs. 4-6).

The two species, *P. syriacus* and *P. Bottæ*, have already been sufficiently well defined by Pictet and Humbert (*op. cit.*), and an imperfectly defined larger species, *P. grandis*, is described by J. W. Davis (Trans. Roy. Dublin Soc. [2] vol. iii. (1887), p. 510, pl. xxviii. fig. 4). An examination of the original specimen of *P. longispina*, Davis (*loc. cit.* p. 511, pl. xxv. fig. 2), convinces me that it does not belong to this genus, but is referable to an entirely distinct fish commonly known as *Clupea Bottæ*, Pict. & Humb. *Pseudoberyx* has hitherto been found only in the Upper Cretaceous of Hakel, Mount Lebanon.

LXVIII.—*Four new Bees of the Genus Perdita collected by Dr. L. O. Howard in Mexico.* By T. D. A. COCKERELL, New Mexico Agricultural College.

Perdita Howardi, sp. n.

♀.—Length about 6 millim.

Bright lemon-yellow; tips of mandibles darkened; frontal fovea a black stripe; a narrow black line extending from each lateral ocellus to the adjacent eye; abdomen with four narrow entire black bands at the sutures between the segments; second abdominal segment with a longitudinal black stripe on each extreme side; pleura without any black patch; tarsi more or less fuscous; stigma faintly tinged with yellowish; nervures colourless; marginal cell obliquely truncate, its substigmatal and poststigmatal parts about equal in length; second submarginal cell narrowed rather more than half to marginal; third discoidal distinct. Head ordinary; lower part of face pellucid white; mesothorax naked, a very narrow black line along its anterior margin; tegulæ colourless, transparent.

♂.—Frontal fovea a black dot; no line from the ocelli to the eyes; abdominal bands more obscure; otherwise like the female. Claws cleft.

Hab. S. José de Guaymas, Mexico, April 10, 1898 (*L. O. Howard*).

It is a pleasure to name this beautiful species after its well-known and esteemed discoverer. *P. Howardi*, by its yellow colour and the absence of a black patch on the pleura, comes near to *luteola*, from which it is easily distinguished by the abdominal bands. It is also a vernal species, whereas *luteola* is autumnal. Seven specimens were obtained.

Perdita Ashmeadi, sp. n.

♀.—Length about $4\frac{1}{2}$ millim.

Head and thorax shining dark olive-green; abdomen flattened, very dark brown above, without marks, dull